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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/691,274	10/22/2003	Thomas Werner	2000.105300	4933
23720	7590	10/10/2006		
WILLIAMS, MORGAN & AMERSON 10333 RICHMOND, SUITE 1100 HOUSTON, TX 77042				
			EXAMINER CHACKO DAVIS, DABORAH	
			ART UNIT 1756	PAPER NUMBER

DATE MAILED: 10/10/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/691,274

Applicant(s)

WERNER ET AL.

Examiner

Daborah Chacko-Davis

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 31 July 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-5, 7-15 and 17-22 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-5, 7-15, 17-22 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- ☐ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.
- ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- ☐ Notice of Informal Patent Application
- ☐ Other: \_\_\_\_\_.

## DETAILED ACTION

### ***Claim Rejections - 35 USC § 102***

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

2. Claims 1-5, and 11-15, are rejected under 35 U.S.C. 102(a) as being anticipated by U. S. Patent No. 6,348,736 (McGahay et al., hereinafter referred to as McGahay).

McGahay, in the abstract, in col 3, lines 63-67, in col 4, lines 1-46, discloses forming a low-k dielectric layer (SSQ, is a silicon-based dielectric layer) on a substrate, positioning the SSQ coated substrate in a plasma chamber and converting by plasma oxidation an upper portion of the SSQ layer to a silicon dioxide layer so as to form a thin oxide layer (cap layer), and patterning the thin oxide layer (sacrificial layer) and the low-k dielectric layer (SSQ layer), wherein the thickness of the thin oxide layer formed is designed so as to cause minimal damage to the underlying SSQ layer, and minimal increase in capacitance in the final structure (i.e., the cap layer and low-k layer corresponds to the desired design thickness). McGahay, in col 4, lines 1-10, discloses that plasma oxidation is performed in plasma chamber, and is heated throughout the process (beginning to the end till desired thickness is obtained, i.e., substrate with the dielectric layer is heated prior to the oxide formation, and continuing the heating during the oxide formation), and in heated to at least 400°C, i.e., the volatile material present in

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the layers (dielectric and oxide layers and substrate) are out-gassed via the plasma chamber exhaust system (Precision 5000, by Applied Materials) (claims 1- 5, and 11-15).

***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 7-10, and 17-22, are rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent No. 6,348,736 (McGahay et al., hereinafter referred to as McGahay) in view of U. S. Patent Application Publication No. 2002/0090822 (Jiang et al., hereinafter referred to as Jiang).

McGahay is discussed in paragraph no. 2.

McGahay, in col 4, lines 1-1-54, and in col 5, lines 1-62, discloses forming a first resist mask over the sacrificial cap layer (thin oxide layer), and patterning the SSQ layer (low-k dielectric layer) to form a trench opening, forming a second resist mask over the thin oxide layer (even the exposed SSQ layer of the trench is further oxidized to form a thin oxide layer or cap layer) i.e., the patterned SSQ layered substrate is again plasma oxidized prior to second resist mask formation (forming a resist layer and patterning the resist layer to form a second resist mask) and heated (eliminates or out-gasses volatile material from the SSQ and oxide layers) to form a thin oxide layer in the bottom of the

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trench; patterning the SSQ layer through the second resist mask to form a via opening, wherein the trench has a greater lateral dimension than the via opening (claims 7-8, 10, 17-18, and 20).

The difference between the claims and McGahay is that McGahay does not disclose that the resist contamination is maintained below a specified level. McGahay does not disclose determining a contamination level of the photoresist or resist residuals prior to forming the first resist mask (claims 9, 19 and 21-22).

Jiang, in [0011], [0012], [0013], [0014], [0015], [0016], [0017], [0018], and [0028], discloses determining the resist poisoning (contamination level in the low-k dielectric layer), and eliminating or reducing the resist poisoning by a corresponding plasma oxidation treatment prior to resist mask formation.

Therefore, it would be obvious to a skilled artisan to modify McGahay by employing the suggestion of Jiang to determine the resist poisoning amount and reduce the poisoning amount in the low-k dielectric layers prior to further laminations or resist layer formations because McGahay, in col 3, lines 4-16, and in col 4, lines 37-46, discloses that the thin oxide formed on the SSQ dielectric layer is impervious and prevents any contaminants (any attack prevented) from reaching the SSQ dielectric layer, and Jiang, in [0016], [0017], [0018], [0028], and [0030], discloses that plasma oxidation of the low-k dielectric layer, along with heating, reduces resist poisoning at the via pattern level, and improves the exposure energy, by lowering the required exposure energy needed, for printing the target CD.

***Response to Arguments***

5. Applicant's arguments filed July 31, 2006, have been fully considered but they are not persuasive. The 102 and 103 rejections made in the previous office action (paper no. 20060615) are maintained.

A) Applicants argue that McGahay does not teach heat-treating the substrate to promote out-gassing prior to forming the sacrificial cap layer.

McGahay teaches heating the substrate with the dielectric layer to about 400°C prior to any oxide formation (cap layer formation, protective dielectric). Heat-treating the substrate (with only the dielectric layer) to such a high temperature will inherently cause out-gassing of volatile materials. During and after the completion of said heat-treating in the plasma environment, an oxide layer (cap layer) is formed on the dielectric layer , after which the substrate is retrieved.

***Conclusion***

6. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

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the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Daborah Chacko-Davis whose telephone number is (571) 272-1380. The examiner can normally be reached on M-F 9:30 - 6:00. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark F Huff can be reached on (571) 272-1385. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

dcd

September 30, 2006.



**JOHN A. MCPHERSON**  
PRIMARY EXAMINER